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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/627,705 | 07/28/2003 | Ju-Hee Cho | 030681-540 | 3166 |

21839 7590 02/13/2006

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| EXAMINER |
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ALEJANDRO, RAYMOND

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| ART UNIT | PAPER NUMBER |
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1745

DATE MAILED: 02/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/627,705

Applicant(s)

CHO ET AL.

Examiner

Raymond Alejandro

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07/28/03.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>12/20/04, 07/28/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Priority

1. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

2. The information disclosure statements (IDS) submitted on 12/20/04 and 07/28/03 were considered by the examiner.

Drawings

3. The drawings were received on 07/28/03. These drawings are acceptable.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. Claims 1 and 6 are indefinite as the language "*a modified silica in which silicon atoms have substituents as represented by formula 1 and formula 2*" does not clearly set forth if applicant is currently intended to claim either only one of the two formula or both formula.

7. Claims 3 and 8 recite the limitation "*the grain size*" in line 2. There is insufficient antecedent basis for this limitation in the claim.

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8. Claims 4 and 9 recite the limitation "*the cation exchange group*" in lines 2 and 1-2, respectively. There is insufficient antecedent basis for this limitation in the claim.

9. Claims 5 and 10 recite the limitations "*the side chain*" in lines 2-4 (claim 5) and line 3 (claim 10); "the total number" in line 4; and "*the backbone*" in line 5. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

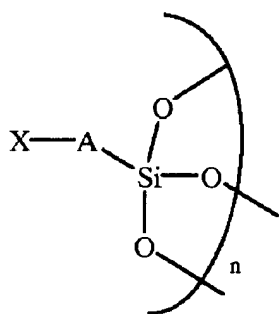
12. Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakano et al 2002/0061432 in view of the Deng et al's publication "*Novel Nafion/Ormosil Hybrids via in-situ Sol-Gel Reactions: 2. Probe of Ormosil Phase Nanostructure by Si Solid State NMR Spectroscopy*" (herein called '*Deng et al*').

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Concerning claim 1 and 6:

Nakano et al disclose a proton conductive film for an electrolytic membrane for a fuel cell, the proton conductive film being a composite body comprising a proton conductive polymer and a compound represented by the general formula (1) (ABSTRACT):

(1)



wherein A represents a substituted or un-substituted divalent organic group (ABSTRACT); and X represents another functional group (ABSTRACT). The atomic group A represents a divalent organic group such as ethylene group, or trimethylene group or phenylene group (P. 0029).

Disclosed is the proton conductive solid polymer such as a perfluorosulfonic acid available under the tradename of NAFION (P. 0007/ EXAMPLE 1-2, 11, 12).

The fuel cell includes the electrolyte, the cathode and the anode as well (P. 0072).

With respect to claim 4-5 and 9-10:

Disclosed is the proton conductive solid polymer such as a perfluorosulfonic acid available under the tradename of NAFION (P. 0007/ EXAMPLE 1-2, 11, 12). Nakano et al also disclose the following (P. 0026):

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[0026] In the proton conductive film according to one embodiment of the present invention, it is possible for the proton conductive polymer to be provided by, for example, a polystyrene-sulfonic acid copolymer, a polyvinyl-sulfonic acid copolymer, a crosslinked alkyl sulfonic acid derivative, a fluorine-containing polymer having a fluorine-containing resin skeleton and a sulfonic group, and a fluorine-containing polymer having a fluorine-containing resin skeleton and a carboxylic group. Particularly, it is most desirable for the proton conductive polymer to be provided by a polymer having at least one of a sulfonic group and a carboxylic group and a fluorine-containing resin skeleton in view of the durability, the film strength and the ionic conductivity.

Nakano et al also disclose the use of a sulfonamide group (P. 0028).

Note: it noted that Nafion is a perfluorosulfonic acid polymer membrane exhibiting the specific claimed fluorine amount-percent.

Nakano et al disclose a fuel cell and polymer composite membrane as seen and described above. However, Nakano et al does not expressly disclose the silicon-based material having the specific silicon-hydrogen bond, and the specific weight content and grain size.

As to claims 1 and 6:

Deng et al disclose a NAFION-organically modified silicon (ABSTRACT) wherein all membranes were converted to the SO₃H form (P. 179, Left Column, 3rd full paragraph).

As to claims 2-3 and 7-8:

It is further disclosed that the unfilled phase-separated morphology of the material has an average center-to-center spacing of 30-50 Å (3-5 nm) (*the grain size*) (paragraph bridging pages 177-178); and the weight content of the silicon-based material is 10.1 or 11.3 or 10.9 or 12.5 or 6.7 wt % (TABLE 1 on page 180).

In view of the above, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the silicon-based material (the invention as a whole) having the specific silicon-hydrogen bond, the specific weight content and grain size of Deng et al in the composite electrolyte of Nakano et al because Deng et al disclose that such silicon-

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based material having the specific silicon-hydrogen bond, the specific weight content and grain size, when used with a polymer material, exhibits good porosity and polarity specifically suitable for gas and liquid separation applications. Accordingly, the composite membrane interior becomes a more hydrophobic environment in which organic molecules are energetically compatible. Particularly, modified Nafion membranes have in fact been effectively tested for transport properties relating to gas and liquid separations.


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (571) 272-1282. The examiner can normally be reached on Monday-Thursday (8:00 am - 6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Raymond Alejandro
Primary Examiner
Art Unit 1745



RAYMOND ALEJANDRO
PRIMARY EXAMINER